



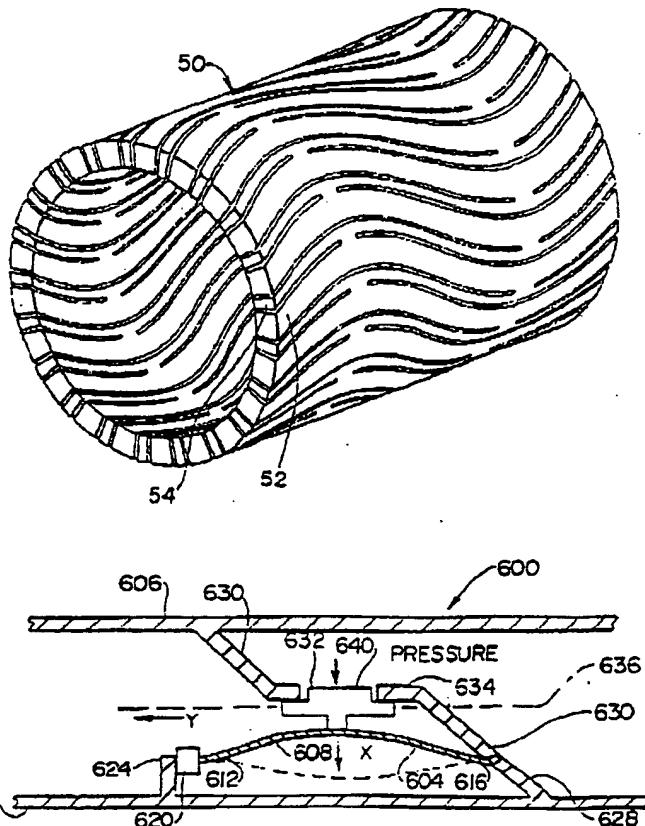
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : A61F 2/06, A61B 17/11, A61F 2/00, F16K 31/00		A3	(11) International Publication Number: WO 98/32412
			(43) International Publication Date: 30 July 1998 (30.07.98)
(21) International Application Number: PCT/US98/01310		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: 23 January 1998 (23.01.98)			
(30) Priority Data: 60/036,359 24 January 1997 (24.01.97) US			
(71) Applicant (for all designated States except US): SCIMED LIFE SYSTEMS, INC. [US/US]; One SciMed Place, Maple Grove, MN 55311-1566 (US).			
(72) Inventor; and		Published	
(75) Inventor/Applicant (for US only): BESSELINK, Petrus, Antonius [NL/NL]; Gronausestraat 1220, NL-7534 AT Enschede (NL).		<i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>	
(74) Agents: ARRETT, Oliver, F. et al.; Vidas, Arrett & Steinkraus, Suite 2000, 6109 Blue Circle Drive, Minnetonka, MN 55343-9131 (US).		(88) Date of publication of the international search report: 12 November 1998 (12.11.98)	

(54) Title: BISTABLE SPRING CONSTRUCTION FOR A STENT AND OTHER MEDICAL APPARATUS

(57) Abstract

The present invention is directed to bistable cells and their use in devices, particularly medical devices such as stents, clamps and valves. An expandable stent formed of a plurality of bistable cells is described. The stent has two or more stable configurations, including a first stable configuration with a first diameter and a second stable configuration with a second, larger diameter. A valve comprising a bistable cell for use in eliminating incontinence is also disclosed.



BEST AVAILABLE COPY

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
RJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 98/01310

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61F2/06 A61B17/11 A61F2/00 F16K31/00

According to International Patent Classification(IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61F A61B F16K F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 96 18359 A (FOUERE) 20 June 1996 see abstract; figures 1,2 ---	1,11-13, 17-21, 28-33
X	WO 95 09584 A (GUERBET) 13 April 1995 see page 9, line 26 - page 10, line 12; figures ---	1,11-13, 21, 28-33, 55-57 58
X	WO 96 09013 A (WAKE FOREST INIVERSITY) 28 March 1996 see abstract; figures 10,14 ---	1,11-13, 30-33 -/-

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

4 September 1998

Date of mailing of the international search report

16.09.98

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patenttaan 2
NL - 2280 HV Rijswijk
Tel: (+31-70) 340-2040; Tx: 31-651 epo-nl;
Fax: (+31-70) 340-3016

Authorized officer

Neumann, E

INTERNATIONAL SEARCH REPORT

Int. Application No

PCT/US 98/01310

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 562 690 A (GREEN ET AL) 8 October 1996	1,54
A	see column 5, line 36 - column 7, line 13; figures 1-8 ---	7,8
P,X	US 5 695 516 A (FISCHELL ET AL.) 9 December 1997	1,9, 11-13, 15,16, 28-33
A	see the whole document ---	2-4
P,X	WO 97 04721 A (MEDSTENT) 13 February 1997 see page 7, line 3 - line 33; figures 1,3,8-10 ---	1,4, 11-13, 28-33
Y	EP 0 587 197 A (ANGIOMED) 16 March 1994 see claim 7 ---	58
A	US 5 234 448 A (WHOLEY ET AL.) 10 August 1993 see the whole document ---	7,8,54
A	WO 95 31945 A (SCIMED LIFE SYSTEMS) 30 November 1995 ---	6
A	EP 0 326 426 A (JAPAN MEDICAL SUPPLY) 2 August 1989 ---	
X	WO 96 41589 A (COOK WILLIAM EUROP ;KAVTELADZE ZAZA ALEXANDROVICH (RU); KORSHOK AL) 27 December 1996 see page 16, line 10 - line 35; figures ---	51
A		37-39, 41-43, 46,47
X	WO 93 22986 A (SCHNEIDER USA INC) 25 November 1993 see page 13, line 16 - line 26 ---	51
A		37-42,47
A	EP 0 688 545 A (TERUMO CORP) 27 December 1995 see abstract; figures ---	37-39, 41-43, 45,47,65
A	EP 0 364 787 A (EXPANDABLE GRAFTS PARTNERSHIP) 25 April 1990 see column 1, line 25 - line 50; figures ---	37-39,65
		-/-

INTERNATIONAL SEARCH REPORT

Int. Application No

PCT/US 98/01310

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 664 107 A (NAZARI STEFANO) 26 July 1995 see column 3, line 44 - column 4, line 37; figures ---	52
X	US 4 994 071 A (MACGREGOR DAVID C) 19 February 1991 see column 3, line 54 - column 4, line 18; figures ---	52
X	GB 2 081 173 A (BEHAR YVES;ALBERTINI PROSPER JEAN; GEFFROY JEAN LOUIS) 17 February 1982 see abstract; figures ---	52
A	US 3 508 587 A (MAUCH HANS A) 28 April 1970 see column 3, line 6 - line 48; figure 2A ---	52,53
X	EP 0 734 698 A (VARIOMED AG) 2 October 1996 see the whole document ---	59
A	EP 0 679 372 A (ADVANCED CARDIOVASCULAR SYSTEM) 2 November 1995 see figures ---	59
A	WO 96 03942 A (RAM MICHAEL J ;KALB IRVIN M (US); SHAW ROBERT H (US)) 15 February 1996 see page 10, line 14 - page 11, line 14; figures ---	66,67, 70,71
A	FR 2 642 812 A (CROUZET SA) 10 August 1990 see abstract; figures ---	66-68
A	EP 0 636 345 A (SENTINEL MEDICAL INC) 1 February 1995 see abstract; figures ---	66,70,71
A	US 3 069 125 A (J.C. HEWITT, JR.) 18 December 1962 see the whole document ---	66,68,69
X	WO 96 29028 A (GRASS ANTHONY JAMES ;UNIV LONDON (GB); ADISESHIAH MOHAN (GB)) 26 September 1996 see page 3, paragraph 1 - paragraph 3; figures ---	73,74
A	see page 6, last paragraph - page 7, paragraph 2 ---	75
X	EP 0 744 164 A (COOK INC) 27 November 1996 see column 6, line 15 - line 37; figures see column 12, line 36 - line 42 ---	73,74
A		75
	-/-	

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 98/01310

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 169 515 A (LIFELINE LTD) 16 July 1986 see the whole document	73
A	-----	74,75
X	EP 0 421 729 A (MEDTRONIC INC) 10 April 1991 see abstract; figures	73,74
A	US 5 141 360 A (ZEMAN DAVID) 25 August 1992 see column 5, line 34 - line 68; figure 3	73-76
A	WO 95 32757 A (NITINOL MEDICAL TECHNOLOGIES I) 7 December 1995 see abstract; figures	73-76

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 98/01310

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.: 48-50 60-64 72
because they relate to subject matter not required to be searched by this Authority, namely:
Rule 39.1(iv) PCT - Method for treatment of the human or animal body by surgery
2. Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International Application No. PCT/US 98/01310

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-36, 54-58

A medical device containing at least one unit cell with one relatively flexible segment and one relatively rigid segment

1.1 Claims 1,2,5-29

A unit cell with symmetrical load-displacement

1.2 Claims 1,3,5-29

A unit cell with asymmetrical load-displacement characteristic, most stable in expanded state

1.3 Claims 1,4-29

A unit cell with asymmetrical load-displacement characteristic, most stable in collapsed state

1.4 Claims 30-36

A medical device with a multistable spring system

1.5 Claim 1,54

A clamp

1.6 Claims 55-58

A graft stent with expansion rings

2. Claims: 37-47,65

A stent with a negativ spring constant

3. Claim : 51

A stent with a plurality of diameters

4. Claims: 52, 53

An expandable device

5. Claim : 59

A stent with wavelike members

INTERNATIONAL SEARCH REPORT

International Application No. PCT/US 98/01310

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

6. Claims: 66-71

A bistable valve

7. Claims: 73-77

A medical device with a cell with four rigid segments

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 98/01310

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
WO 9618359	A 20-06-1996	FR 2728156	A	21-06-1996
		AU 4119896	A	03-07-1996
		EP 0843538	A	27-05-1998
WO 9509584	A 13-04-1995	FR 2710834	A	14-04-1995
		AT 162065	T	15-01-1998
		AU 7858594	A	01-05-1995
		CA 2173500	A	13-04-1995
		DE 69407984	D	19-02-1998
		DE 69407984	T	03-09-1998
		EP 0722304	A	24-07-1996
		ES 2115262	T	16-06-1998
		JP 9503141	T	31-03-1997
WO 9609013	A 28-03-1996	US 5702419	A	30-12-1997
		AU 3418395	A	09-04-1996
		CA 2200489	A	28-03-1996
US 5562690	A 08-10-1996	NONE		
US 5695516	A 09-12-1997	NONE		
WO 9704721	A 13-02-1997	AU 6511196	A	26-02-1997
		EP 0840578	A	13-05-1998
		NO 980302	A	24-03-1998
		PL 324781	A	08-06-1998
		US 5776181	A	07-07-1998
EP 587197	A 16-03-1994	DE 9014230	U	21-11-1991
		AT 107495	T	15-07-1994
		DE 9116936	U	01-09-1994
		DE 59102001	D	28-07-1994
		DK 481365	T	07-11-1994
		EP 0481365	A	22-04-1992
		ES 2057709	T	16-10-1994
		JP 4256759	A	11-09-1992
US 5234448	A 10-08-1993	AT 156986	T	15-09-1997
		CA 2090763	A,C	29-08-1993
		CA 2173636	A	29-08-1993

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/US 98/01310

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US 5234448	A	DE 69313162 D		25-09-1997
		EP 0558352 A		01-09-1993
		EP 0781528 A		02-07-1997
		US 5254127 A		19-10-1993
WO 9531945	A 30-11-1995	CA 2190012 A		30-11-1995
		EP 0759730 A		05-03-1997
		JP 10500595 T		20-01-1998
EP 326426	A 02-08-1989	JP 1192367 A		02-08-1989
		JP 2561853 B		11-12-1996
		CA 1307885 A		29-09-1992
		DE 68920055 D		02-02-1995
		DE 68920055 T		11-05-1995
		US 4950258 A		21-08-1990
WO 9641589	A 27-12-1996	AU 6121896 A		09-01-1997
		EP 0836450 A		22-04-1998
WO 9322986	A 25-11-1993	AU 693054 B		18-06-1998
		AU 1905397 A		19-06-1997
		AU 678350 B		29-05-1997
		AU 3789793 A		13-12-1993
		CA 2134090 A,C		25-11-1993
		CA 2179668 A		09-11-1993
		DE 9390115 U		22-12-1994
		EP 0639958 A		01-03-1995
		JP 2660101 B		08-10-1997
		JP 7502673 T		23-03-1995
		US 5645559 A		08-07-1997
EP 0688545	A 27-12-1995	JP 8000738 A		09-01-1996
		JP 8196642 A		06-08-1996
		JP 8215318 A		27-08-1996
EP 0364787	A 25-04-1990	AU 623438 B		14-05-1992
		AU 4248589 A		12-04-1990
		CA 1322628 A		05-10-1993
		GR 3003987 T		16-03-1993
		JP 2174859 A		06-07-1990

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 98/01310

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP 0364787 A		JP 2680901 B US 5195984 A		19-11-1997 23-03-1993
EP 0664107 A	26-07-1995	IT 1269443 B US 5554183 A		01-04-1997 10-09-1996
US 4994071 A	19-02-1991	NONE		
GB 2081173 A	17-02-1982	FR 2487086 A DE 3127446 A JP 57052015 A		22-01-1982 06-05-1982 27-03-1982
US 3508587 A	28-04-1970	NONE		
EP 0734698 A	02-10-1996	DE 19512066 A DE 19540851 A AT 169484 T DE 19516191 A JP 9010318 A		28-11-1996 07-05-1997 15-08-1998 06-02-1997 14-01-1997
EP 0679372 A	02-11-1995	CA 2147709 A JP 8126704 A US 5725572 A		26-10-1995 21-05-1996 10-03-1998
WO 9603942 A	15-02-1996	US 5476434 A AU 3320695 A CA 2195949 A CN 1159155 A EP 0793465 A JP 10507652 T US 5509889 A US 5704353 A		19-12-1995 04-03-1996 15-02-1996 10-09-1997 10-09-1997 28-07-1998 23-04-1996 06-01-1998
FR 2642812 A	10-08-1990	NONE		
EP 0636345 A	01-02-1995	AU 677061 B AU 6746894 A CA 2127637 A JP 7313520 A US 5562692 A		10-04-1997 02-02-1995 27-01-1995 05-12-1995 08-10-1996

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 98/01310

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP 0636345	A	US	5735815 A	07-04-1998
US 3069125	A	18-12-1962	NONE	
WO 9629028	A	26-09-1996	AU 5116896 A CA 2216522 A EP 0817599 A	08-10-1996 26-09-1996 14-01-1998
EP 0744164	A	27-11-1996	AU 5240596 A CA 2176987 A JP 9099095 A US 5707376 A	19-12-1996 26-11-1996 15-04-1997 13-01-1998
GB 2169515	A	16-07-1986	NONE	
EP 0421729	A	10-04-1991	CA 2026604 A DE 69024901 D DE 69024901 T IE 73670 B JP 3151983 A	03-04-1991 29-02-1996 14-08-1996 02-07-1997 28-06-1991
US 5141360	A	25-08-1992	US 5292073 A US 5263791 A US 5224796 A	08-03-1994 23-11-1993 06-07-1993
WO 9532757	A	07-12-1995	US 5540712 A CA 2191307 A EP 0788390 A JP 10504200 T US 5746765 A	30-07-1996 07-12-1995 13-08-1997 28-04-1998 05-05-1998

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- BLACK BORDERS**
- IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- FADED TEXT OR DRAWING**
- BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- SKEWED/SLANTED IMAGES**
- COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- GRAY SCALE DOCUMENTS**
- LINES OR MARKS ON ORIGINAL DOCUMENT**
- REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- OTHER:** _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.